

Item Monitor Protocol

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RadNet Item Monitor Protocol
Thursday, February 19, 2004



RadNet Standard Header

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RadNet Message Header Format

The RadNet header contains the **first 55 bytes** of all RadNet messages. The header is intended to provide information regarding the operational status and location of an instrument. The header provides information regarding which instruments are (or are not) operating properly.

Field Name	Type	Position	Codes	Notes
Header Check Sum	Byte	1		The first byte (01, byte) is a checksum, to ensure the integrity of the header transmission. The checksum is the sum of bytes 2 through 55.
RadNet Version Number	Byte	2	See RadNet Versions Page	The second byte (02, byte) is the RadNet version number. It is used to indicate the version of the RadNet message. The receiving software is responsible for handling all received RadNet messages, although the most current version's functionality may not be provided.
Message Codes	Byte	3	See RadNet Message Codes Page	Byte (03) is the message code. The message code tells what type of RadNet message has been sent (status, check source, etc.).
Server Address	Word	4-5	None	Bytes (4-5) are the server address (1-64,536) of the pushing device. Since each instrument may perform as its own server, two bytes are used.
Monitor Address	Byte	6	None	Byte (6) is the address (1-256) of a specific monitor hooked up to a server. This protocol is intended to support existing (RS-485) systems. The practicality of hooking up more than 256 monitors to a single RadNet server is questionable.
Server Status	Byte	7	See RadNet Server Status Codes Page	Byte (7) is a code to display the status of the server. Codes are provided for normal as well as a variety of abnormal conditions.
Hardware Status	Byte	8	See Op/Hw Status Page Codes Page	Byte (8) is a code to display the overall Hardware Status of the instrument. Hardware status is intended to be a troubleshooting guide when responding to an abnormal condition. Instrument hardware malfunctions generally require repair work. Other conditions could be attributed to either hardware or operational problems. The instrument vendors are responsible for classifying conditions and prioritizing the status

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				change. The intention is that only the most critical status change be pushed; however a series of messages based upon a list of status changes could also be pushed. For example: If the instrument detected failures with low voltage, and low background, then the vendor could push each status in a separate message (at the abnormal push rate). These statuses could then be interpreted by the client as a HV power supply failure.
Operational Status	Byte	9	See Op/Hw Status Page Codes Page	Byte (9) is a code to display the overall Operational Status of the instrument. Operational status is intended to be a troubleshooting guide when responding to an abnormal condition. Instrument operational problems generally require response by health physics personnel. Other conditions can be attributed to either hardware or operational problems. The instrument vendors are responsible for classifying conditions and prioritizing the status change. The intention is that only the most critical status change be pushed; however a series of messages based upon a list of status changes could also be pushed. For example: If the instrument detected failures with low voltage, and low background, then the vendor could push each status in a separate message (at the abnormal push rate). These statuses could then be interpreted by the client as a HV power supply failure.
Location	Char[40]	10-49	None	Bytes (10-49) are for the location of the instrument. Location designations are highly individual, so no convention or specification is given. The location label must be left justified. Unused characters must be padded with space characters.
Authentication Byte Count Offset	Word	50-51		The length in bytes of the original message. If non-zero, indicates that authentication is in effect. If zero, then authentication is not implemented See the following web pages for more information: Background Information RadNet Implementation Authentication Encryption

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Authentication Status	Byte	52	See RadNet Authentication Status Codes Page	"Invalid" flag. This byte is always set to zero when the message is transmitted. Authentication services set this byte to a non-zero value if the message fails signature verification. Clients check this byte with zero meaning valid data and take appropriate "bad data" action if the byte is non-zero. See the following web pages for more information: Background Information RadNet Implementation Authentication Encryption
Reserved For Future Use	Byte	53	None	Byte (53) is reserved for future use and must be filled with zero values until specified by the protocol
Monitor Type	Word	54-55	See RadNet Monitor Type Codes Page	Bytes (54-55) are a code for the instrument type.

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Item Monitor Body Format

The Item Contamination Monitor (ICM) body message has data conforming to generic ICM formats. The message provides transaction data and has specific information regarding an instrument's readings. A RadNet header must precede all body messages. The header contains the first 55 bytes of a RadNet message.

If an instrument does not support the RadNet value, the value must be padded to the proper length. For example, if an instrument does not support Item ID entry (a character value), the Item ID bytes must be shipped as spaces (ASCII 32). Number values must be shipped as a zero value. For example, if sum zone alarms (byte 114) is not supported, it must be pushed as a zero value "00000000b".

Field Name	Type	Position	Codes	Notes
ICM Message Type	Byte	56	See ICM Message Type Codes Page	The first byte of the body (56) is the ICM Message Type Code. This code is intended to provide information about the type of message being pushed and will indicate if there is transactional (or other) data following this byte.
Measurement Status	Byte	57	See ICM Measurement Status Codes Page	Byte (57) is the Measurement Status Code and is intended to provide information about the measurement that was performed.
User ID	Char[16]	58-73	N/A	Bytes (58-73) are the User ID. The format of this character string is not specified. The User ID label must be left justified. Unused characters must be padded with space characters.
ITEM ID	Char[16]	74-89	N/A	Bytes (74-89) are for an item ID number or description. The format of this character string is not specified. The Item ID label must be left justified. Unused characters must be padded with space characters.
Month	Byte	90	N/A	Byte (90) is the month of the year.
Day	Byte	91	N/A	Byte (91) is the day of the month.
Year	Word	92-93	N/A	Bytes (92-93) is the year. This format includes all four digits of the year (1997, etc.)
Hour	Byte	94	N/A	Byte (94) is the hour of the day.
Minute	Byte	95	N/A	Byte (95) is the minute.
Seconds	Byte	96	N/A	Byte (96) is the second.
Cal Date Month	Byte	97	N/A	Byte (97) is the calibration date month of

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				the year.
Cal Date Day	Byte	98	N/A	Byte (98) is the calibration date day of the month.
Cal Date Year	Word	99-100	N/A	Bytes (99-100) are the calibration date year. This format includes all four digits of the year (1997, etc.)
Number Of Detectors Alarmed	Byte	101	N/A	Byte (101) is the number of detectors that have alarmed.
Number Of Sum Zones Alarmed	Byte	102	N/A	Byte (102) is the number of alarmed Sum Zones. Sum zone alarms are detectors that are grouped to form functional zones, for the purpose of detecting distributed contamination.
Sum Channel Alarmed	Byte	103	See ICM Sum Channel Alarmed Codes Page	Byte (103) is a code for the existence of a summed channel alarm (yes or no).
Alpha Alarm Code	Byte	104	See ICM Alarm Codes Page	Byte (104) is a code for the existence of an alpha alarm.
Alpha Detector Number (highest)	Byte	105	N/A	Byte (105) is the number of alarmed alpha detectors (1-XX) or sum zone.
Highest Alpha Reading	Float	106-109	N/A	Bytes (106-109) are the highest alpha detector or sum zone reading in units of Bq. It is anticipated that this reading will be used in conjunction with an alarm state and can also be used with all readings to demonstrate ALARA practices. Units = Bq
Beta Alarm Code	Byte	110	See ICM Alarm Codes Page	Byte (110) is a code for the existence of a beta alarm (yes or no).
Beta Detector Number (highest)	Byte	111	N/A	Byte (111) is the number of alarmed beta detectors (1-XX) or sum zone.
Highest Beta Reading	Float	112-115	N/A	Bytes (112-115) are the highest beta detector or sum zone reading in units of Bq. It is anticipated that this reading will be used in conjunction with an alarm state and can be used with all readings to demonstrate ALARA practices. Units = Bq
Gamma Alarm Code	Byte	116	See ICM Alarm Codes Page	Byte (116) is a code for the existence of a gamma alarm (yes or no).
Gamma Detector Number (highest)	Byte	117	N/A	Byte (117) is the number of alarmed gamma detectors (1-XX) or sum zone.
Highest Gamma	Float	118-121	N/A	Bytes (118-121) are the highest gamma

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Reading				detector or sum zone reading in units of Bq. It is anticipated that this reading will be used in conjunction with an alarm state and can also be used with all readings to demonstrate ALARA practices. Units = Bq
Number Of Channels	Word	122-123	N/A	Bytes (122-123) are the number of repeating footer frames that follow the body message. A zero value indicates that there is no data in the footer.

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Item Monitor Footer Format

The Item Contamination Monitor (ICM) footer message has data conforming to generic ICM formats. The message provides data that is identical for each channel. A RadNet header and body must precede all footer messages. The header contains the first 55 bytes of a RadNet message, the ICM body contains the next 68 bytes, for a total of 123 bytes preceding the footer. By placing a zero value into the "number of channels" field, a vendor can attach their own data to this area. If the footer is used, then a vendor can attach data to the end of the footer. The vendor is responsible for handling this data, however, as RadNet does not support this function. The vendor may have it considered for implementation into RadNet protocol by presenting it to the RadNet committee.

Footer bytes are shown as $(124+y)+10(x)$. The number 124 represents the 124 bytes that precede the footer. The "y" is the number of bytes that have preceded the value in that channel frame. The number 10 is the number of bytes in the footer. The "x" is the number of channel iterations that have occurred before the byte value is examined.

Note: Red Field Names = Repeating Fields

Field Name	Type	Position	Codes	Notes
<i>Channel Number</i>	<i>Word</i>	<i>$[(124+10x)-(125+10x)]$</i>		<i>The first byte $[(124+10x)-(125+10x)]$ is the Channel Number/Detector Number presented in the frame and can be used as the detector number (ICM). Although not strictly required, since the frame length and number of frames are known, having the channel number in the frame can assist when troubleshooting. The intention for use is as follows: If the ICM has 10 detectors and two channels per detector (Gamma and Beta), the footer would contain 20 frames. You could pass gamma results in frames 1-10 and beta in 11-20.</i>
<i>Channel Type</i>	<i>Byte</i>	<i>$(126+10x)$</i>	<i>See Channel Types Page</i>	<i>Byte $(126+10x)$ of the footer is a code for Channel Type.</i>
<i>Channel Hardware Status</i>	<i>Byte</i>	<i>$(127+10x)$</i>	<i>See Op/Hw Status Page</i>	<i>Byte $(127+10x)$ is a code for the Hardware Status of the Channel.</i>
<i>Channel Operational Status</i>	<i>Byte</i>	<i>$(128+10x)$</i>	<i>See Op/Hw Status Page</i>	<i>Byte $(128+10x)$ is a code for the Operational Status of the Channel.</i>
<i>Reading</i>	<i>Float</i>	<i>$[(129+10x) - (132+10x)]$</i>		<i>Byte $[(129+10x) - (132+10x)]$ is the reading for the channel.</i>
<i>Units</i>	<i>Byte</i>	<i>$(133+10x)$</i>	<i>See RadNet Units Page</i>	<i>Byte $(133+10x)$ is a code for the Units of the reading.</i>

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Example of Item Monitor Measurement Message Format:

RadNet Field	Start Byte Position	End Byte Position	Notes
Start Of RadNet Header			
Header Check Sum	1	1	The check sum is calculated using byte 2 to 55.
RadNet Version	2	2	Value = 0
Message Code	3	3	Value = 0, standard RadNet message
Server Address	4	5	Value = 1 to 65535. This setting is user defined and must be unique to each instrument on the network.
Monitor Address	6	6	Value = 1 to 255 This setting is user defined and must be unique to each instrument on the network.
Server Status	7	7	Value = 0
Hardware Status	8	8	Value = 0
Operational Status	9	9	Value = 1, High Alarm
Location	10	49	Value = "PCM, Bldg 10, Room 143, SN 19384*** " * = ASCII Character Value 32 (blank space)
Authentication Byte Count Offset	50	51	Value = 0, No authentication is being done.
Authentication Status	52	52	Value = 0, No authentication is being done
R1	53	53	No used at this time
Monitor Type	54	55	Value = ,13 Item Contamination Monitor
End Of RadNet Header			
Start of Item Monitor Body			

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Item Monitor Message Type	56	56	Value =1
Measurement Status	57	57	Value =1, Alarmed
User ID	58	73	Value = "123456*****" * = ASCII Character Value 32 (blank space)
Item Id	74	89	Value = "83748-22*****" * = ASCII Character Value 32 (blank space)
Month	90	90	Value =3
Day	91	91	Value =23
Year	92	93	Value =2003
Hour	94	94	Value =15
Minute	95	95	Value =45
Seconds	96	96	Value =10
Calibration Date Month	97	97	Value =3
Calibration Date Day	98	98	Value =12
Calibration Date Year	99	100	Value=2002
Number Of Detector(s) Alarmed	101	101	Value =3
Number Of Sum Zones Alarmed	102	102	Value =0
Sum Channel Alarmed	103	103	Value =0. False
Alpha Alarm Code	104	104	Value =1, Detector Alarmed
Alpha Detector Number (Highest)	105	105	Value =12
Highest Alpha Reading	106	109	Value =12345
Beta Alarm Code	110	110	Value =0, No Alarms
Beta Detector Number (Highest)	111	111	Value =0
Highest Beta Reading	112	115	Value = 4233
Gamma Alarm Code	116	116	Value =0, No Alarms
Gamma Detector Number (highest)	117	117	Value =0
Highest Gamma Reading	118	121	Value = 123
Number of Channels	122	123	Value = 4

End Of Item Monitor Body

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Start Of Item Footer (Repeating Frames)

Channel Number	124	125	Value =1
Channel Type	126	126	Value =0, Alpha
Channel Hardware Status	127	127	Value =0, Normal
Channel Operational Status	128	128	Value =0, Normal
Reading	129	132	Value = 1243
Units	133	133	Value =5, Bq
End Of Measurement 0 Data			
Channel Number	134	135	Value = 1
Channel Type	136	136	Value = 1, Beta
Channel Hardware Status	137	137	Value = 0, Normal
Channel Operational Status	138	138	Value =0, Normal
Reading	139	142	Value = 324
Units	143	143	Value =5, Bq
End Of Measurement 1 Data			
Channel Number	144	145	Value =2
Channel Type	146	146	Value =0, Alpha
Channel Hardware Status	147	147	Value =0, Normal
Channel Operational Status	148	148	Value =1, High Alarm
Reading	149	152	Value = 124387
Units	153	153	Value =5, Bq
End Of Measurement 2 Data			
Channel Number	154	155	Value = 2
Channel Type	156	156	Value = 1, Beta
Channel Hardware Status	157	157	Value = 0, Normal
Channel Operational Status	158	158	Value =0, Normal
Reading	159	162	Value = 348
Units	163	163	Value =5, Bq

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End Of Measurement 3 Data

End Of Item Monitor Footer (Repeating Frames)

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Example of Item Monitor Status Message Format:

RadNet Field	Start Byte Position	End Byte Position	Notes
Start Of RadNet Header			
Header Check Sum	1	1	The check sum is calculated using byte 2 to 55.
RadNet Version	2	2	Value = 0
Message Code	3	3	Value = 0, standard RadNet message
Server Address	4	5	Value = 1 to 65535. This setting is user defined and must be unique to each instrument on the network.
Monitor Address	6	6	Value = 1 to 255 This setting is user defined and must be unique to each instrument on the network.
Server Status	7	7	Value = 0
Hardware Status	8	8	Value = 0
Operational Status	9	9	Value = 1, High Alarm
Location	10	49	Value = "PCM, Bldg 10, Room 143, SN 19384*** " * = ASCII Character Value 32 (blank space)
Authentication Byte Count Offset	50	51	Value = 0, No authentication is being done.
Authentication Status	52	52	Value = 0, No authentication is being done
R1	53	53	No used at this time
Monitor Type	54	55	Value = 13, Item Contamination Monitor
End Of RadNet Header			
Start of Item Monitor Body			

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Item Monitor Message Type	56	56	Value = 0 Note: Nothing follows this Byte (end of data).
End Of Item Monitor Body			

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Item Measurement Status Codes

Byte (57) is the Measurement Status Code and is intended to provide information about the measurement that was performed.

Code	Meaning	Notes
0	Normal	"Normal" is intended to indicate that the measurement was normal.
1	Alarmed	"Alarmed" is intended to indicate that the measurement resulted in an alarm.
2	Aborted	"Aborted" is intended to indicate that the measurement was aborted.

Item Monitor Alarm Codes

Item Monitor Alarm Codes are for the existence of an alarm (yes or no).

Code	Meaning	Notes
0	No Alarms	"No Alarms" indicates that no alarms were received for this channel.
1	Detector Alarmed	"Detector Alarmed" indicates that there is at least one detector that alarmed. The "Alpha (Beta, Gamma) Detector Number" displays the number of the alarmed detector with the highest contamination level.
2	Sum Zone Alarmed	"Sum Zone Alarmed" indicates that there is at least one sum zone that alarmed. The "Alpha (Beta, Gamma) Number Of Sum Zones Alarmed" is the number of alarmed sum zones.
3	Sum Channel Alarmed	"Sum Channel Alarmed" indicates that there is at least one sum channel alarm. "Sum Channel Alarmed" will indicate a value of "1" (true).

Item Monitor Message Type Codes

The first byte of the body (56) is the ICM Message Type Code. This code is intended to provide information about the type of message being pushed. Such information will indicate if there is transactional (or other) data following this byte.

Code	Meaning	Notes
0	Status Only	"Status Only" is intended to be used to indicate that there is no other values following this field. The ICM is pushing status information only. The client software will only process to byte 56.
1	Measurement	"Measurement" is intended to indicate that a measurement is being pushed. Bytes 57 to (at least) 131 will be filled.

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ICM Sum Channel Alarmed Codes

Byte (103) is a code for the existence of an alpha alarm (yes or no).

Code	Meaning	Notes
0	False	"False" is intended to indicate there is not a sum channel alarm.
1	True	"True" is intended to indicate there is a sum channel alarm.

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Authentication Status Codes

See the following pages for more information concerning RadNet Security Implementation:

[Background Information](#)
[RadNet Security Implementation](#)
[Authentication](#)
[Encryption](#)

These codes indicate whether a RadNet message has been authenticated (message fails signature verification). RadNet message(s) are directed to/at a RadNet Authentication Server (RAS) or other device. The RAS will authenticate the message and set byte 52 to indicate the status of the authentication process. The RAS server will then forward the message to clients on the network. It is important that the RAS server is secure and that the data leaving the RAS server is on a secure network (the message will not be tampered with after authenticated). It is also important to note that the RAS server does not strip the authentication keys from the message, and the authentication process could be done at any time, including storing the authentication signature within a database for future verification of the message.

The Authentication software/server will set this byte value to indicated message signature verification status.

Code	Meaning	Notes
0	Message is Ok	
>0	Message fails signature verification.	

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RadNet Channel Types

Below is a code for type of channel.

Code	Meaning	Notes
0	Alpha	
1	Beta	
2	Gamma	
3	Neutron	
4	Iodine	
5	Noble Gas	
6	Tritium	
7	Stack Flow	
8	Sample Flow	
9	Temperature	
10	Sample Pressure	
11	Leak rate	Primary to secondary, or containment building leak
12	Reactor power	Used for leak measurements
13	Beta + Gamma	The sum of the beta and gamma channels.
14	Latitude	
15	Longitude	
16	Altitude	
17	Humidity	
18	Wind Speed	
19	Wind Direction	
20	Alpha/Beta	
21	Pulse Height Analysis (PHA)	
22	Dust Particle	
23	Humidity	
24	Anemometer	

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RadNet Monitor Type Codes

Bytes (54-55) are code for the instrument type.

Code	Meaning	Notes
0	Gamma Area Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
1	Gamma Crit Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
2	Neutron Area Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
3	Neutron Crit Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
4	Alpha CAM	Uses the Alpha CAM body, Measurement Footer, Spectrum Footer. See Alpha CAM Header, Body, Measurement Footer, Spectrum Footer and Notes for more information.
5	Beta CAM	Uses the Beta Cam body and footer format. See Beta CAM Header, Body, Footer and Notes for more information.
6	PCM Monitor	Uses the PCM body and footer format. See PCM Header, Body, Footer and Notes for more information.
7	PCM Portal Monitor	Uses the PCM Body and Footer format. See Portal Header, Body, Footer and Notes for more information.
8	PING	Uses the PING Body and Footer format. See PING Header, Body, Footer and Notes for more information.
9	Glove Box Monitor/Hand Monitor	Uses The PCM Body and Footer format. See PCM Header, Body, Footer and Notes for more information.

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10	Hand And Foot Monitor	Uses The PCM Body and Footer format. See Hand and Foot Header, Body, Footer and Notes for more information.
11	Generic Sensor	Uses The Generic Sensor Body and Footer format. See Generic Sensor Header, Body, Footer and Notes for more information.
12	Electronic Reading Dissymmetry	See Header, ERD Body, ERD Footer, for more information.
13	Item Contamination Monitor (ICM)	Uses The ICM Body and Footer format. See Header, Body, Footer and Notes for more information.
14	Radiation Gateway Monitor	Uses The Radiation Gateway Body and Footer format. See Header, Body, Footer and Notes for more information.
15	Gamma Spectrum	Uses The Gamma Spectrum Body, Measurement, Spectrum, Status and Footer format. See Header, Body, Measurement, Spectrum, Status and Notes for more information.
16	Portable Instruments	Protocol Pending, in development by vendor
17	Meteorology Tower	Uses The Meteorology Tower Body and Footer format. See Header, Body, Measurement, Status, and Notes for more information.
18	Video	Uses The Video Body, Status and Footer format. See Header, Body, Footer, Status and Notes for more information.
19	Image	Protocol Pending, in development by vendor
20	Audio	Protocol Pending, in development by vendor
21	Security data tag/seal	Protocol Pending, in development by vendor
22	Tritium Air Monitor	Protocol Pending, in development by vendor
23	Dust Particle Monitor	Protocol Pending, in development by vendor

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RadNet Message Codes

Byte (03) is the message code. The message code indicates what type of RadNet message has been sent (status, check source, etc.).

Code	Meaning	Notes
0	Normal/Standard RadNet Message	Message is pushed by the instrument and received by the clients.
1	Alarm Ack	Message is pushed by the clients and received by the instruments. See Alarm Acknowledge Alarm Msg. Notes and Alarm Acknowledge Header Format
2	Pass Through	Message is pushed by the instrument and received by the client or can be pushed by the client and received by the instrument. This method can be used for bi-directional communication by the clients and instruments. See Pass Through Msg. Header Notes / Pass Through Header Format or Pass Through Codes
3	Check Source	Message is pushed by the clients and received by the instruments. See Check Source Msg. Notes and Check Source Header Format
4	Diagnostic/Self-Check	Message is pushed by the clients and received by the instruments. See Diagnostic/Self-Check Msg. Notes and Diagnostic/Self-Check Header Format
5	Request Data	A client/server sends this request to an instrument. In response to this request the instrument will send its current information (Normal RadNet Message). See Request Data Notes and Request Data Header Format
6	Update/Request Date/Time	A client/server sends this request to an instrument. In response to this request the instrument will send/set the date/time. See Update/Request Date/Time Notes and Update/Request Date/Time Header Format
7	Acknowledge Receipt	This message is used by the monitoring computer to acknowledge receipt of data from an instrument. See Acknowledge Receipt Message Header Format and Acknowledge Receipt Message Notes for more information.
255 (FFh)	Encrypted RadNet Message	See the following pages for more information: Background Information RadNet Implementation

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		Encryption Header Message Format Encryption Background Information
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RadNet Operational and Hardware Status Codes

Note: It is the responsibility of the instrument manufacturer to prioritize the operational and hardware status for the instrument. Any status code can be used either as an operational or hardware status code base upon the instrument usage or needs.

Below is a code used to display the Hardware/Operational Status of the instrument. Hardware status is intended to be a troubleshooting guide when responding to an abnormal condition. Instrument hardware malfunctions generally require repair work. Other conditions may be attributed to either hardware or operational problems. Instrument vendors are responsible for classifying conditions and prioritizing the status change. The intention is that only the most critical status change be pushed; however a series of messages based upon a list of status changes could also be pushed. For example: If the instrument detected failures with low voltage and low background, the vendor could push each status in a separate message (at the abnormal push rate). These statuses could then be interpreted by the client as an HV power supply failure.

OP = Guide For Operational Status Use

HW = Guide For Hardware Status Use

Code	Meaning	OP	HW	Notes
0	Normal	Y	Y	
1	High Alarm	Y	N	
2	HV Fail	N	Y	
3	Count Fail	Y	N	
4	Bkg Fail	Y	N	
5	Bkg Update	Y	N	
6	Comm Fail	N	Y	
7	Gas Empty	Y	N	
8	Buffer Full	Y	Y	
9	Acked High Alarm	Y	N	
10	Flow Fail Low	Y	Y	
11	Flow Fail High	Y	Y	
12	Filter Door Open	Y	N	
13	Instrument Not Ready	Y	Y	
14	Instrument In Calibration Mode	Y	Y	
15	Fast Concentration Alarm	Y	N	
16	Slow Concentration Alarm	Y	N	
17	DAC Hours Alarm	Y	N	
18	Count Rate Alarm	Y	Y	
19	Release Rate Alarm	Y	N	

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20	Fast Concentration Alarm Disabled	Y	N	
21	Slow Concentration Alarm Disabled	Y	N	
22	Count Rate Alarm Disabled	Y	N	
23	Check Source Mode	Y	N	
24	Out Of Service	Y	Y	
25	Alert Alarm	Y	N	
26	Trend Alarm	Y	N	
27	Not Initialized	Y	Y	
28	Standby	Y	Y	
29	Local Control	Y	Y	
30	Flush	Y	N	
31	Alarm Disabled	Y	N	
32	External Fail	Y	Y	
33	AC Off	Y	Y	
34	Crit Relay Fail	Y	Y	
35	Out Of Limits	Y	Y	
36	Crit Alarm	Y	N	
37	NV RAM Fail	N	Y	When the instrument's non-volatile RAM cannot be read/written.
38	Check Source Results	N	Y	Indicates that the message with this status carries check source results. This indicates that this message contains the final check source result at the completion of the check source integration. Prior to this code being sent the status code would be 23 (<i>Check Source Mode</i>).
39	Audio Failure	N	Y	Indicates that the instrument has a problem with its audio circuit.
40	Over Range	Y	Y	Indicates that the instrument has exceeded an Over Range value.
41	Diagnostic/Self-check completed, Passed self-check	Y	Y	Indicates that the instrument has performed an Internal Diagnostic/Self-check and found no error conditions. See Diagnostic/Self-Check Msg. Notes and Diagnostic/Self-Check Header Format

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42	Diagnostic/Self-check completed, Failed self-check	Y	Y	Indicates that the instrument has performed an Internal Diagnostic/Self-check and found error conditions. See Diagnostic/Self-Check Msg. Notes and Diagnostic/Self-Check Header Format
43	High/High Alarm	Y	N	Third alarm level used in many plants.
44	Internal stabilization failure	Y	N	From automatic energy stabilization.
45	Parameter error	Y	N	Bad setup.
46	Temperature failure	N	Y	Temperature out of operational range.
47	Power supply failure	N	Y	From power supply, or from voltage reading.
48	Analog input failure	N	Y	4-20 mA analog input failure (0 mA for example).
49	Filter failure	N	Y	Automatic filter advance failure (motor, end of roll...).
50	Detector cable failure	N	Y	
51	Electronic or Acquisition board failure	N	Y	Electronic failure.
52	Low Battery	N	Y	Backup battery or internal battery has a low voltage condition.
53	Battery Failed	N	Y	Backup battery or internal battery has failed.
54	Clock Failed	N	Y	Internal clock has failed.
55	User defined	Y	Y	This error code is used whenever an instrument supports user defined error codes. It is used whenever there is a desire to inform a user that one of their error conditions has been reached. Since there is no way of knowing what is contained in the error code logic, this generic response should be used to indicate the error.
56	Internal Communication Failure	N	Y	

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RadNet Versions

Note: The last approved version in this list is the current version in use by RadNet.

The second **byte (02, byte)** is the RadNet version number. This number is used to indicate the version of RadNet be pushed by the server. It is the responsibility of the receiving software to handle all received RadNet messages, although the most current version's functionality may not be provided.

Version	Date Approved	Notes
0	Approved	

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RadNet Units Codes

Below is a code for the RadNet units of the reading.

Code	Meaning	Notes
0	cps	
1	Rem/hr	
2	R/hr	
3	Sv/hr	
4	Bq/cm ³	
5	Bq	
6	Degrees Centigrade (C)	Temperature Unit
7	Pascal (Pa)	Pressure Unit
8	cc	Flow Volume Unit
9	cc/sec	Flow Rate Unit
10	cps/cc	Activity Unit
11	counts	Counting Events Unit
12	cm/sec	Velocity Unit
13	bqMeV/cc	Gamma Gas Activity
14	degrees	Wind Direction (180 = south)
15	Gy/hr	Dose Rate Unit
16	RPU%	Reactor Power Unit
17	Kg/sec	Masse flow rate
18	n/cm ²	Neutrons / cm ²
19	n/cm ³	Neutrons / cm ³
20	DAC	Derived Air Concentration
21	bq/m ³	Becquerel per cubic meter
22	bq/kg	Becquerel per kilogram
23	Latitude	
24	Longitude	
25	Mu_Hemin	Hemisphere North
26	Mu_Hemis	Hemisphere South
27	Mu_Hemie	Hemisphere East
28	Mu_Hemiw	Hemisphere West
29	Mu_Knots	Wind Speed (knots)
30	Mu_KPH	Wind Speed (knots per hour)
31	Mu_MPS	Wind Speed (meters per second)
32	Mu_MPH	Wind Speed (meters per hour)

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33	Mu_METERS	Altitude (meters)
34	Mu_Feet	Altitude (feet)
35	Mu_Percent	Humidity
36	Resistance	Electrical Resistance
37	µm	Micro-meter

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RadNet Server Status Codes

Byte (7) is a code that displays the status of the server. Codes are provided for normal as well as a variety of abnormal conditions. See Appendix A for Server Status message codes.

Code	Meaning	Notes
0	Normal Operation	
1	Instrument Communication Error	
2	TCP Communication Error	
3	UDP Communication Error	
4	Hard Disk Full	
5	Password Fail	
6	Starting Up	
7	Shutting Down	
8	Program Error	
9	NetWork Access Granted	
10	NetWork Access Denied	